Bunsen lamp without any alteration in weight being noticeable. The products of combination are generally gaseous mixtures of CF_4 and probably C_2F_4. When the most readily attacked varieties of carbon are employed, and only in small quantities so as to avoid excess, the gas is almost pure CF_4. Carbon tetrafluoride is a colourless gas, which liquefies under a pressure of five atmospheres at 10° C. It is completely absorbed and decomposed by an alcoholic solution of potash with production of potassium fluoride and carbonate. On decomposing the latter salt with an acid the volume of carbon dioxide liberated is the same as that of the carbon tetrafluoride used. CF_4 is slightly soluble in water, more readily in carbon tetrachloride, alcohol, or benzene. Determinations of its density gave numbers which agreed with the formula CF_4. If excess of carbon is heated to redness in a platinum tube, and fluorine allowed to slowly stream through, another gas is obtained on collecting over water which is not capable of being absorbed by alcoholic potash. This gas liquefies at 10° under a pressure of 19–20 atmospheres. M. Moissan does not seem to have yet determined its composition, but it appears likely to be the C_2F_4 described in the second communication by M. Chabrié. M. Moissan also states that CF_4 may likewise be prepared by passing vapour of carbon tetrachloride over silver fluoride heated to a temperature of 300° C. in a glass or metal tube. M. Chabrié shows that both CF_4 and C_2F_4 may be obtained by heating the corresponding chlorides of carbon with silver fluoride in a sealed tube to 220° C. In an actual experiment 5·1 grams of AgF were heated with 1·55 grams of CCl_4 for two hours, at the end of which time the tube, which itself was but little attacked, was opened, and an almost theoretical yield of CF_4 obtained; the gas was totally absorbed by alcoholic potash in accordance with the equation $CF_4 + 6KOH = K_2CO_3 + 4KF + 3H_2O$. When C_2Cl_4 was used instead of CCl_4, a gas whose density corresponded to the formula C_2F_4 was obtained. The experimental density was 3·43; the calculated value for C_2F_4 is 3·46. The spectra of the two fluorides, according to M. Moissan, exhibit the lines of fluorine very clearly, together with several broad bands, resembling the flutings of carbon.

OUR ASTRONOMICAL COLUMN.

OBJECTS FOR THE SPECTROSCOPE.

Sidereal Time at Greenwich at 10 p.m. on February 20 = 8h. 3m. 7s.

Name.	Mag.	Colour.	R A. 1890.	Decl. 1890.
			h. m. s.	° ′
(1) G.C. 1565	—	—	7 36 25	- 14 29
(2) 27 Cancri	6	Yellowish-red.	8 20 39	+13 1
(3) β Cancri	4	Yellow.	8 10 36	+ 9 32
(4) ζ Canis Min. ...	5	White.	7 46 0	+12 3
(5) 26 Pickering ...	Var.	Reddish-yellow.	7 57 2	- 12 47
(6) S Cygni	Var.	Reddish.	20 3 14	+57 40

Remarks.

(1) "Planetery nebula; pretty bright, pretty small; extremely little elongated." The spectrum has not yet been recorded.

(2) A star of Group II. Dunér states that the bands are very wide and dark in the red, but weaker in the green and blue. He does not, however, state what bands are present. Observations similar to those already suggested for other stars of the group are required.

(3) This is stated to have a fine spectrum of the solar type by Vogel. The usual differential observations are required.

(4) A star of Group IV. (Vogel). Usual observations required.

(5) This star has a very feeble spectrum of the Group VI. type, which has not yet been fully described.

(6) Although Cygnus is not now in the most convenient position for observations, it may still be observed soon after sunset. The variable, S Cygni, has not yet had its spectrum recorded, and the approaching maximum (February 28) may therefore be taken advantage of. Gore states the period as 323 days, and the range as from 8·8–10·1 at maximum to <13 at minimum. If it has a banded spectrum, as may be expected from the colour, the type of spectrum will probably not be difficult to determine, notwithstanding the faintness of the star.

A. FOWLER.

PROGRESS OF ASTRONOMY IN 1886.—An account of the progress of astronomy in the year 1886, by Prof. Winlock, has been issued from the Smithsonian Institution. Although the record is primarily intended to serve as a series of notes for those who have not access to a large astronomical library, the bibliography will be found useful to the professional astronomer as a reference list of technical papers. A considerable amount of useful information is given in this extract from the Smithsonian Report for 1886–87, the section devoted to reports of Observatories being very complete. A subject-index to the review has been effected by inserting the necessary page references to the bibliography.

THE MAXIMUM LIGHT-INTENSITY OF THE SOLAR SPECTRUM.—We have received from Dr. Mengarini his paper on the above subject (*Untersuchungen zur Naturlehre des Menschen und der Thiere*, xiv. Band, 2 Heft). After reviewing the previous work that has been done on the varying intensity of different parts of the spectrum, the author describes the three methods he used in his researches. The observations led him to conclude that the maximum of light-intensity is subject to variability in position from day to day and hour to hour, just as the maxima of thermal and chemical effects of the spectrum, although the sky be clear and the atmosphere steady. Using a prismatic spectrum, it was found that the maximum light-intensity fluctuated between about λ 564 and D, and, generally speaking, was more pronounced in the morning than in the afternoon. Some observations made at Rome in July 1881, on clear or slightly clouded days, showed that the maximum shifted from λ 564·1 to 584·3.

SPECTRUM OF BORELLY'S COMET, *g* 1889.—Mr. Backhouse, in a letter to the *Observatory*, notes that he observed the spectrum of this comet with a Browning miniature spectroscope on the 15th and 19th ultimo. The three CO bands were very vividly seen, but no other line; on the former date there was a very faint continuous spectrum, but on the latter only a suspicion of such.

SPECTRA OF δ AND μ CENTAURI.—Prof. Pickering, in a communication to *Astronomische Nachrichten*, No. 2951, records that an examination of the photographs of stellar spectra taken by Mr. S. J. Baily at the Harvard Observatory station, near Closica, Peru, shows that the F line due to hydrogen is bright in the spectra of the stars δ and μ Centauri.

ON THE STAR SYSTEM ξ SCORPII.—Some elaborate researches into the orbits of the components of this system were given by Dr. Schorr in an inaugural dissertation at Munich University last year. All available measures of position-angle and distance have been brought together and compared with those derivable from the new elements found, making the computation of great value.

GEOGRAPHICAL NOTES.

ON Tuesday, Dr. Nansen lectured in Christiania on his plan for a North Pole Expedition. He advocates the employment of a ship built with a special view to strength, having its sides constructed at such an angle that, instead of being crushed by the ice, the vessel would be raised by it. The Expedition, he thinks, should advance through the Behring Straits, where the vessel would be carried northward by a favourable current. At the New Siberian Island the vessel would enter the ice-floes. It would then "proceed towards the North Pole, in which direction the current would probably carry it."

THE *Colonies and India* gives the last news from Cooktown relating to Sir William Macgregor's explorations in New Guinea. His project was to ascend the Fly River on another voyage of discovery. It seems that Sir William and his party, in a steam launch, dropped anchor in the river on December 14. The

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launch stranded, and fifteen canoes, carrying about 150 natives, bore down upon the explorers and commenced a savage attack. The Governor's party opened fire, and the natives promptly beat a retreat. After about half an hour, however, they returned, bringing a pig as a peace offering. Sir William consequently went 180 miles further up the river, and on his return visited the same people again, to find them quite peaceably inclined. The Governor started again on December 26 to explore higher up the Fly River.

THE Survey Department of Burmah has in preparation a new map containing all the latest information derived from the parties sent out by the Department. A preliminary issue omitting all the mountain ranges has recently been published.

SIGNOR G. B. SACCHIERO, Italian Consul at Rangoon, sends to the *Bollettino* of the Italian Geographical Society for December an interesting notice of the savage Chin tribes who occupy the hilly region in the north of Burma about the headwaters of the Irawady. The collective tribal name is variously written Chin, Kyen, Kiyin, Kachin, Kakyen, &c.; but they call themselves Sihù, and according to Signor Sacchiero they evidently belong to the Burmese branch of the Mongol stock. In the districts brought under British rule many have already adopted the Burmese dress, and these can with difficulty be distinguished from the Burmese themselves. But the language is more allied to that of the widespread Karen race, and the Karen alphabet composed by the American missionaries in Lower Burma is well suited for expressing the sounds of the Chin idiom. The Chins themselves have no knowledge of letters; nor have they made any progress beyond the rudest state of social culture. They still go nearly naked, and the women on arriving at the age of puberty are tattooed all over the face with a black pigment, being thus disfigured for life, either to prevent the Burmese or the neighbouring tribes from kidnapping them, or else to distinguish them from the women captured by the Chins from the surrounding peoples. They marry early, the bride requiring the consent, not of her parents, but of an elder brother, and the husband promising not to beat her too much, nor to cut her hair if she behaves well. The family yields obedience to the father alone, who recognizes no authority except that of the village chief, this authority passing in both cases to the youngest son. The men always carry firearms, and make their own gunpowder, using instead of sulphur a seed called *aunglak*, first roasted, and then pounded up with charcoal and saltpetre, three parts of the two first to twenty of the last, and mixing the whole with alcohol, or tobacco juice. Both sexes smoke little Indian hookahs, and their favourite drink is *khaung*, a kind of beer extracted from fermented rice. They live mainly by the chase, and when a boar, stag, or other big game is captured, there are great rejoicings in the village. The quarry is covered from neck to tail in a red cloth, and presented to the "temple," or abode of the *nat* (spirit); then the "friend of the *nat*" (priest) pronounces a blessing on the successful hunter, after which all join in the feast, with much tamtaming, shouting, drinking, and dancing through the village. When they descend to the plains, the Chins are Buddhists, but in their villages spirit-worshippers. Not only every village and every district, but every person has his special *nat*, mostly a malevolent being who requires to be pacified by propitiatory offerings. The vendetta is a universal institution, feuds being inherited from family to family, from tribe to tribe, and thus leading to constant bloodshed. If a man is drowned, his son seeks vengeance on the water where he perished by piercing it with spears or slashing it about with long knives. Many of the Chins have already tendered their submission to the British authorities, and arrangements are now in progress for extending orderly government over the whole territory.

ON SOME NEEDLESS DIFFICULTIES IN THE STUDY OF NATURAL HISTORY.[1]

A LITTLE while ago I read, in the preface to a work on natural history, that the book was "of little value to the scientific reader, but that its various anecdotes, and its minute detail of observation would be found useful and entertaining."

What, then, may the "scientific reader" be expected to desire? He must be, in my opinion, a most unreasonable man, if he does not thankfully welcome anecdotes of the creatures he wishes to study, when these anecdotes are the result of patient and accurate observation. For it is precisely such information, that is conspicuously absent from many scientific memoirs and monographs; the author generally spending his main space and strength in examining the shape and structure of his animals, and in comparing one with another, but giving the most meagre details of their lives and habits.

Which, then, is the more scientific treatment of a group of animals—that which catalogues, classifies, measures, weighs, counts, and dissects, or that which simply observes and relates? Or, to put it in another way, which is the better thing to do—to treat the animal as a dead specimen, or as a living one?

Merely to state the question is to answer it. It is the living animal that is so intensely interesting, and the main use of the indexing, classifying, measuring, and counting is to enable us to recognize it when alive, and to help us to understand its perplexing actions.

But, it may be objected, that because the study of the living animal is the more interesting, it is not necessarily the more scientific; indeed, that the amount of entertainment, which we may get out of the pursuit of natural history, has nothing to do with the question at all; that by science we mean accurate knowledge presented in the most suitable form; that shape, structure, number, weight, comparison are the fundamental notions, with which sciences of every kind have to deal; and that scientific natural history is more properly that which takes cognizance of a creature's size, form, bodily organs, and relation to other creatures, than that which concerns itself with the animal's disposition and habits.

I can fancy that I already hear some of my audience say: "But why set up any antagonism between these two ways of studying a creature? Both are necessary to its thorough comprehension, and our text-books should contain information of both kinds; we should be told how an animal is made, where it ought to be placed among others of the same group, and also how it lives, and what are its ways."

Precisely; that is just what memoirs and text-books ought to do; but what, too often, they do *not*. We read much of the animal's organs; we see plates showing that its bristles have been counted, and its muscular fibres traced to the last thread; we have the structure of its tissues analyzed to their very elements; we have long discussions on its title to rank with this group or that; and sometimes even disquisitions on the probable form and habits of some extremely remote, but quite hypothetical ancestor—some "archirotator" (to take an instance from my own subject) who is made to degrade in this way, or to advance in that, or who is credited with one organ, or deprived of another, just as the ever-varying necessities of a desperate hypothesis require:—but of the living creature itself, of the way it lives, of the craft with which it secures its prey or outwits its enemies, of the home that it constructs, of its charming confidence or its diabolical temper, of its curious courtship, its droll tricks, its games of play, its fun and spite, of its perplexing stupidity coupled with actions of almost human sagacity—of all this, this which is the real natural history of the animal, we, too often, hear little or nothing. And the reason is obvious, for in many cases the writer has no such information to give; and, even when he has, he is compelled by fashion to give so much space to that which is considered to be the more scientific portion of his subject, that he has scant room for the more interesting. Neither ought we to be surprised if a writer is "gravelled for the lack of matter," when he comes to speak of an animal's life; for the study of the lives of a large majority is a difficult one. It requires not only abundant leisure, but superabundant patience, a residence favourably situated for the pursuit, and an equally favourable condition of things at home. The student, too, must be ready to adopt the inconvenient hours of the creatures that he watches, and be indifferent to the criticisms of those that watch *him*. If his enthusiasm will not carry him, without concern, through dark nights, early mornings, vile weather, fatiguing distances, and caustic chaff, the root of the matter is not in him. Besides, he ought to have a natural aptitude for the pursuit, and know how to look for what he wants to see; or if he does not know, to be able to make a shrewd guess: and, above all, when circumstances are not favourable, to have wit enough to invent some means of making them so. And yet when the place, the man, the animals, and the circumstances all seem to promise a rich harvest of observations, how often it happens that some luckless accident, a snapt twig, a

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[1] The Presidential Address to the Royal Microscopical Society, at the annual meeting, on February 12, 1890, by Dr. C. T. Hudson, F.R.S.

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